



Armed Forces College of Medicine AFCM



Pathology of Lung Tumors

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A bouquet of purple flowers, possibly ranunculus, is arranged diagonally across the frame. The flowers are in various stages of bloom, with some showing multiple layers of petals. The background is a soft, out-of-focus light gray. Overlaid on the flowers is the text "GOOD MORNING" in a large, yellow, serif font with a white outline.

GOOD MORNING

INTENDED LEARNING OBJECTIVES (ILO)



By the end of this lecture the student will be able to:

1. Enumerate epithelial and mesenchymal lung tumors
2. Determine lung hamartoma
3. Describe the pathology of carcinoid tumor of the lung
4. Describe the pathology of different types of bronchogenic carcinoma
5. Explain effects and spread of bronchogenic carcinoma
6. Discuss metastatic tumors to the lung

Lecture Plan

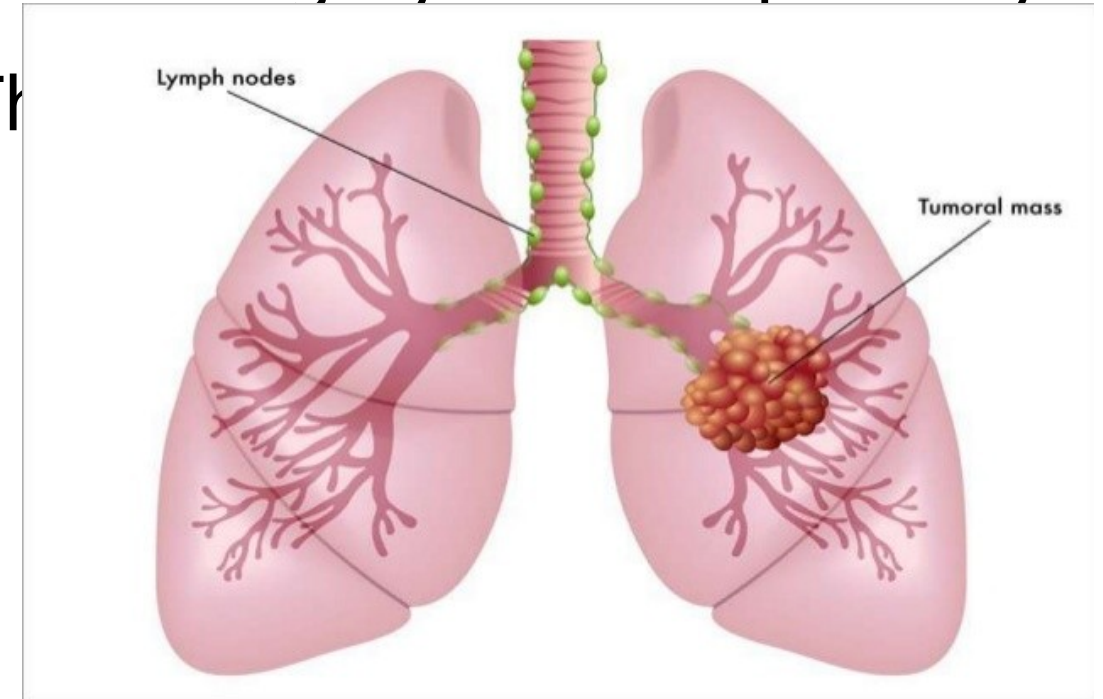


1. Part 1 (5 min) Introduction
2. Part 2 (35 min) Main lecture
3. Part 3 (5 min) Summary
4. Lecture Quiz (5 min)

Pathology of lung tumors



Lungs are frequently affected by metastasis but primary lung cancer is also a common disease. Roughly 95% of primary lung tumors are carcinomas. The carcinoids, mesenchymal malignancies, lymphomas and few benign tumors.



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Epithelial tumors of the lung



Benign

- Papilloma
- Adenoma

Locally malignant

- Carcinoid Tumors
- Carcinoma In situ

Malignant

- Squamous cell carcinoma
- Small cell carcinoma
- Adenocarcinoma
- Acinar (predominant)
- Papillary (predominant)
- Lepidic predominant (formerly bronchioloalveolar)
- Solid predominant with mucin formation
- Large cell carcinoma

Other Lung



MESENCHYMAL TUMOURS:

Fibroma, fibrosarcoma, leiomyoma, leiomyosarcoma, chondroma, hemangioma, lymphangioma

MISCELLANEOUS TUMOURS:

Pulmonary blastoma
Malignant lymphoma
Malignant melanoma
Carcinosarcoma

SECONDARIES: From the breast, kidney, stomach, ...etc

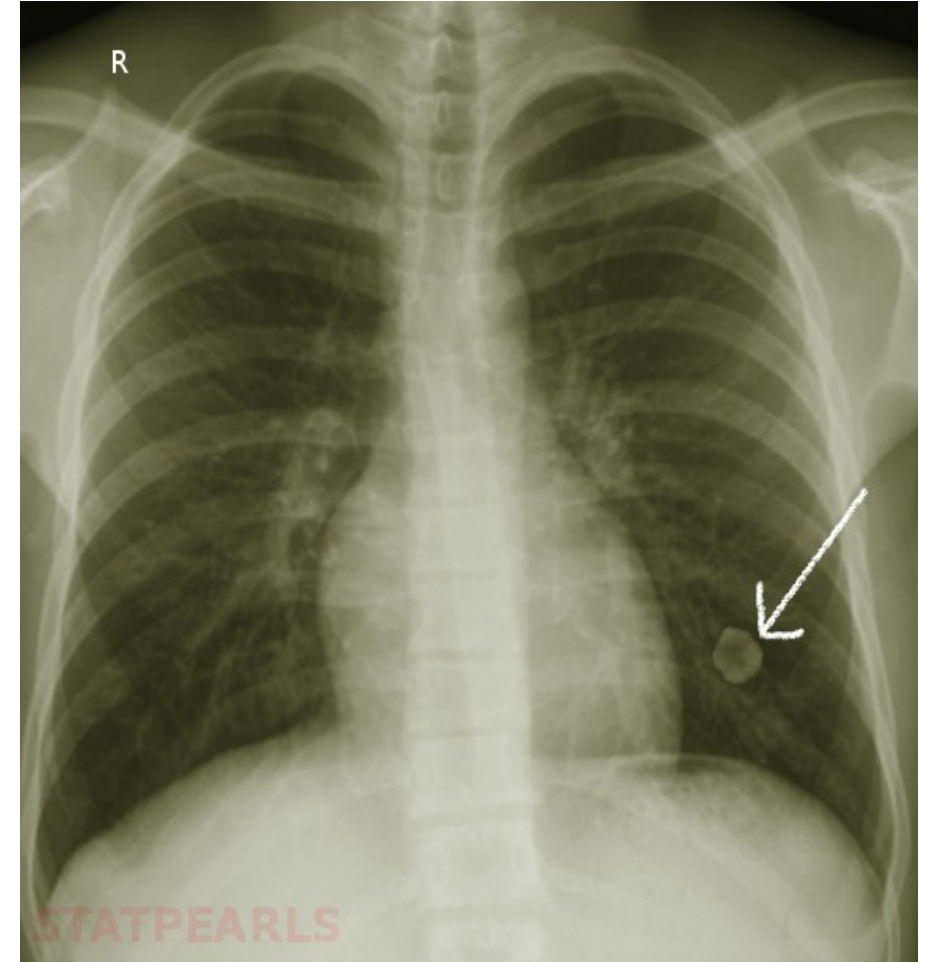
Pulmonary hamartoma



It is a benign tumor;

occurs more commonly in middle-aged adults but also occurs in children. They appear as **coin lesion** on chest x-ray.

It is a local malformation or overgrowth of local cells, caused by genetic abnormality that affects the developmental cycle of multiple cells



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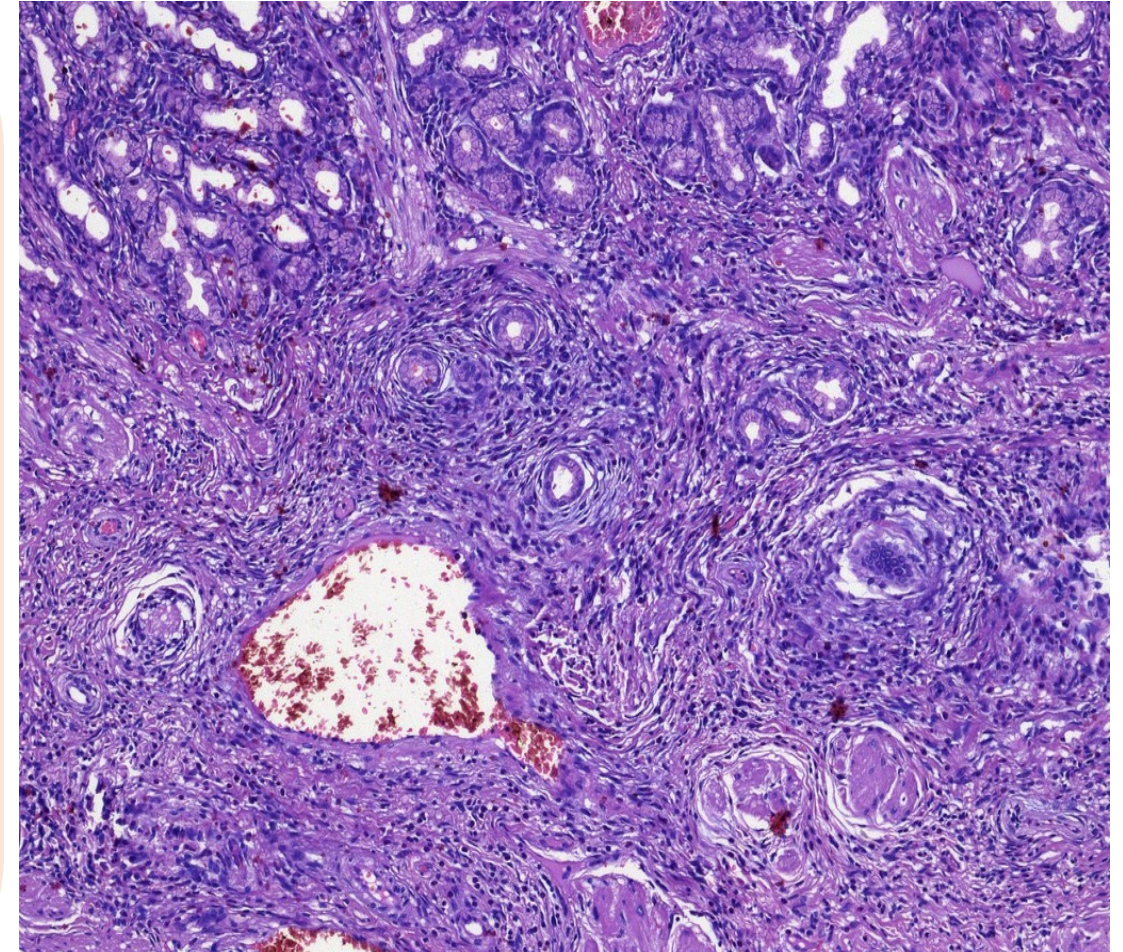
Pulmonary hamartoma



Microscopically, hamartoma is comprised of non-encapsulated mixture of cartilage, connective tissue, muscles, fat and bone.

Carney triad is the finding of a hamartoma with:

- 1- Predominantly cartilaginous component (pulmonary chondroma),
- 2- Extra-adrenal paraganglioma
- 3- Gastric gastrointestinal stromal tumor.



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Bronchial carcinoids

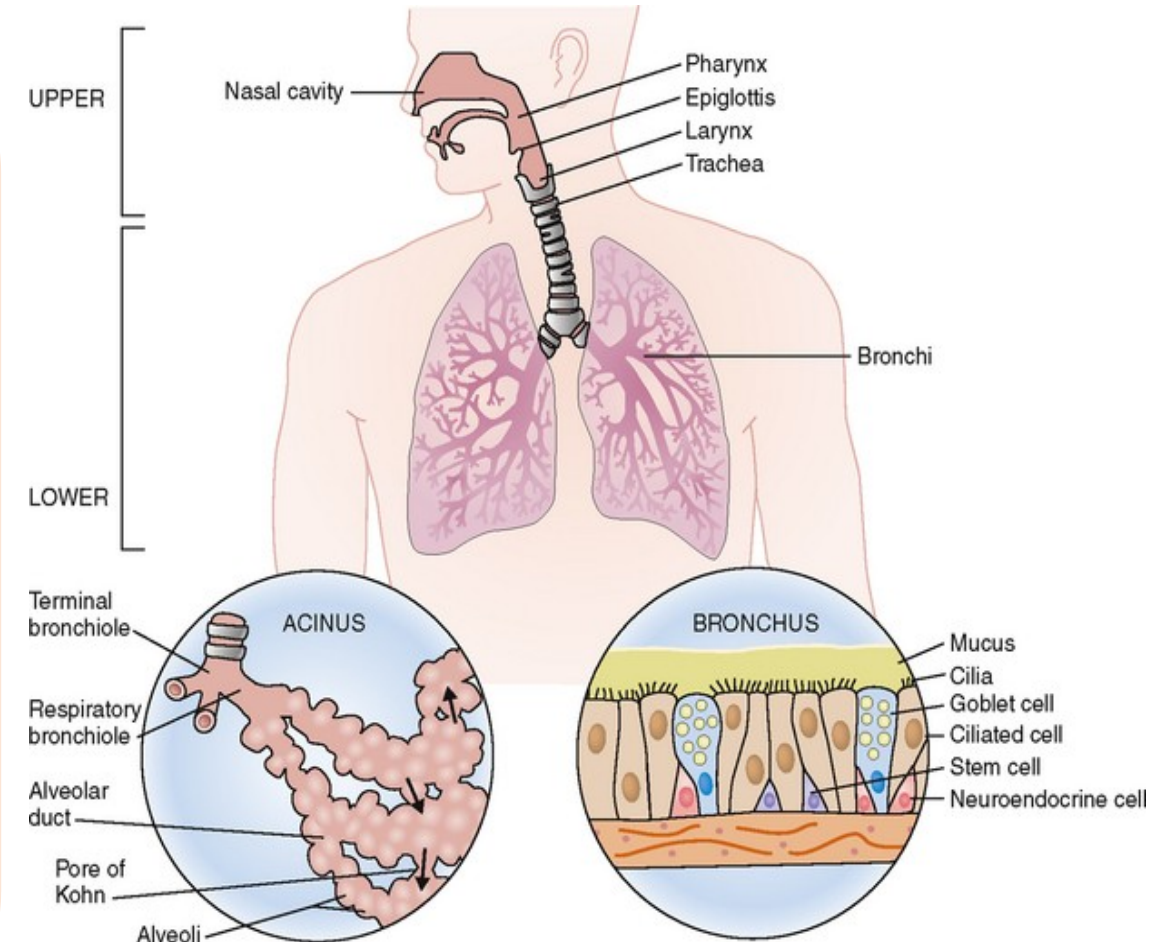


They are malignant tumors arising from **neuroendocrine cells** of the bronchial epithelium. They may secrete hormonally active **polypeptides (serotonin)**

They are classified into:

- Typical (low grade) carcinoid
- Atypical (intermediate grade) carcinoid.

Incidence: more common in females, usually occurs before the age of 40 years.



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Bronchial carcinoids



Grossly:

- ❑ Most carcinoids originate in **main bronchi**
- ❑ Grow in one out of two patterns
A spherical mass less than 4 cm in diameter covered by intact mucosa. The mass projects into the bronchial lumen

Sometimes the growth projects in the lumen of the bronchus and invades the surrounding lung tissue forming a **dumb bell-shaped** tumor.



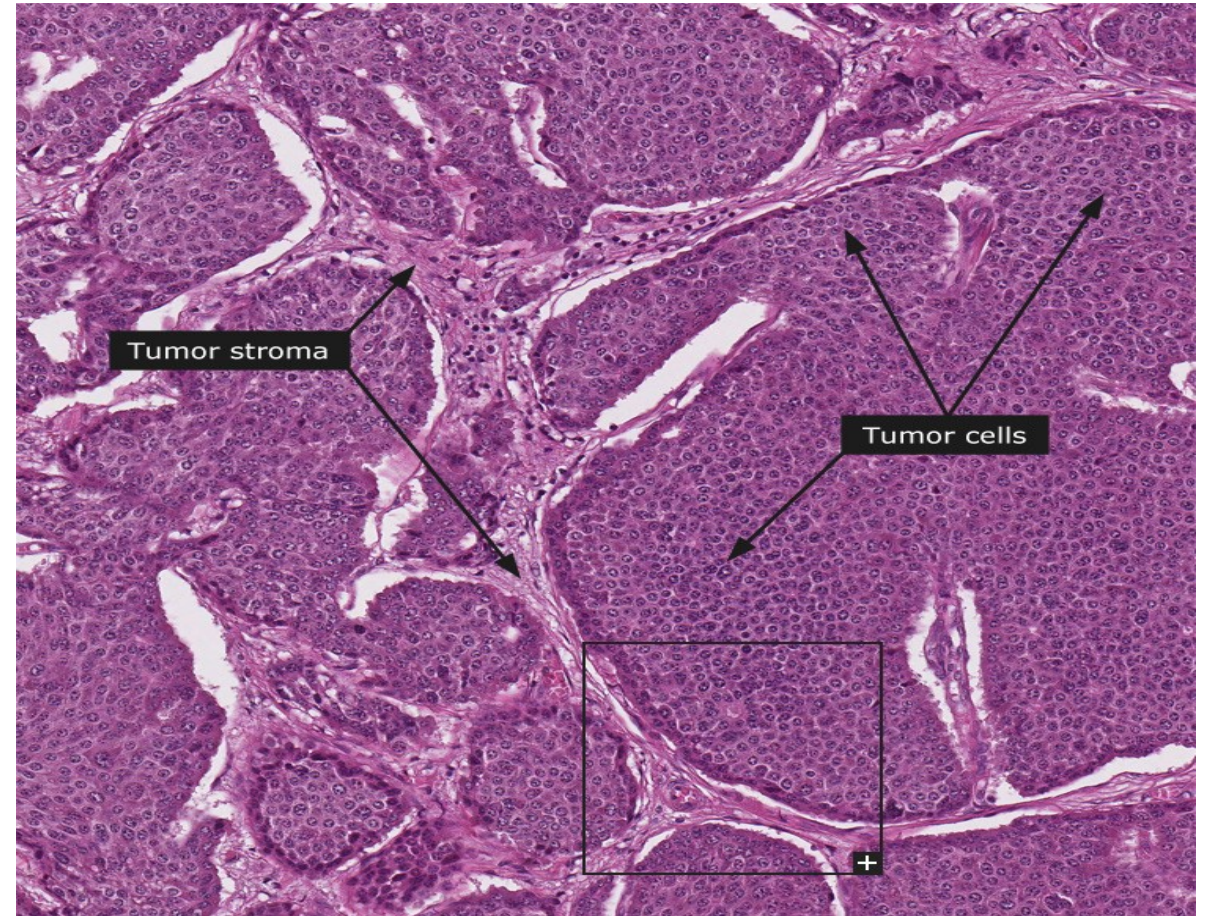
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Bronchial carcinoids



Microscopically; 1-Typical carcinoids

- Nests of uniform small cells with regular round nuclei separated by delicate fibrous stroma
- Absent or rare mitosis
- No necrosis
- The cells contain argyrophilic granules that can be shown by silver stains



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Bronchial carcinoids

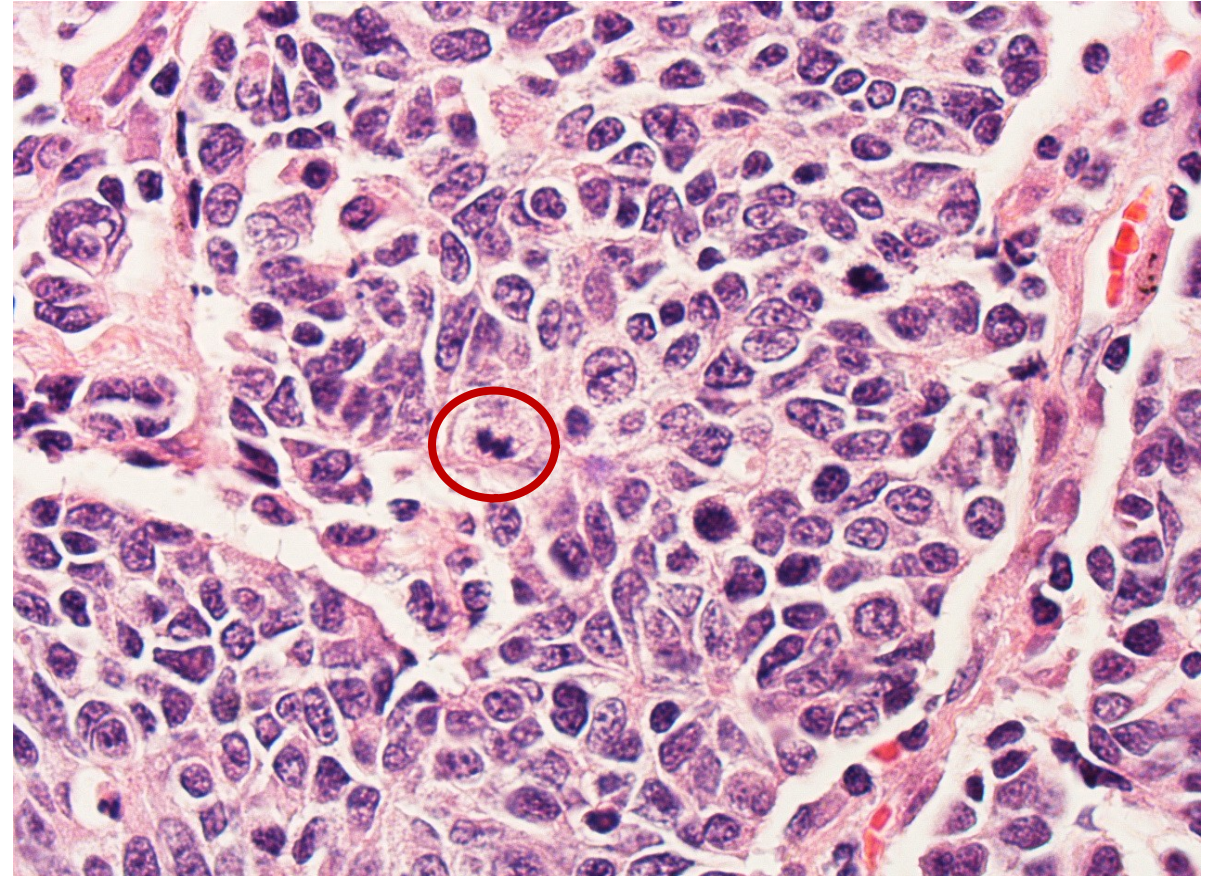


2-Atypical carcinoid

Is the term given to **more aggressive carcinoids**

characterized by

- Higher mitotic rate
- Focal necrosis.



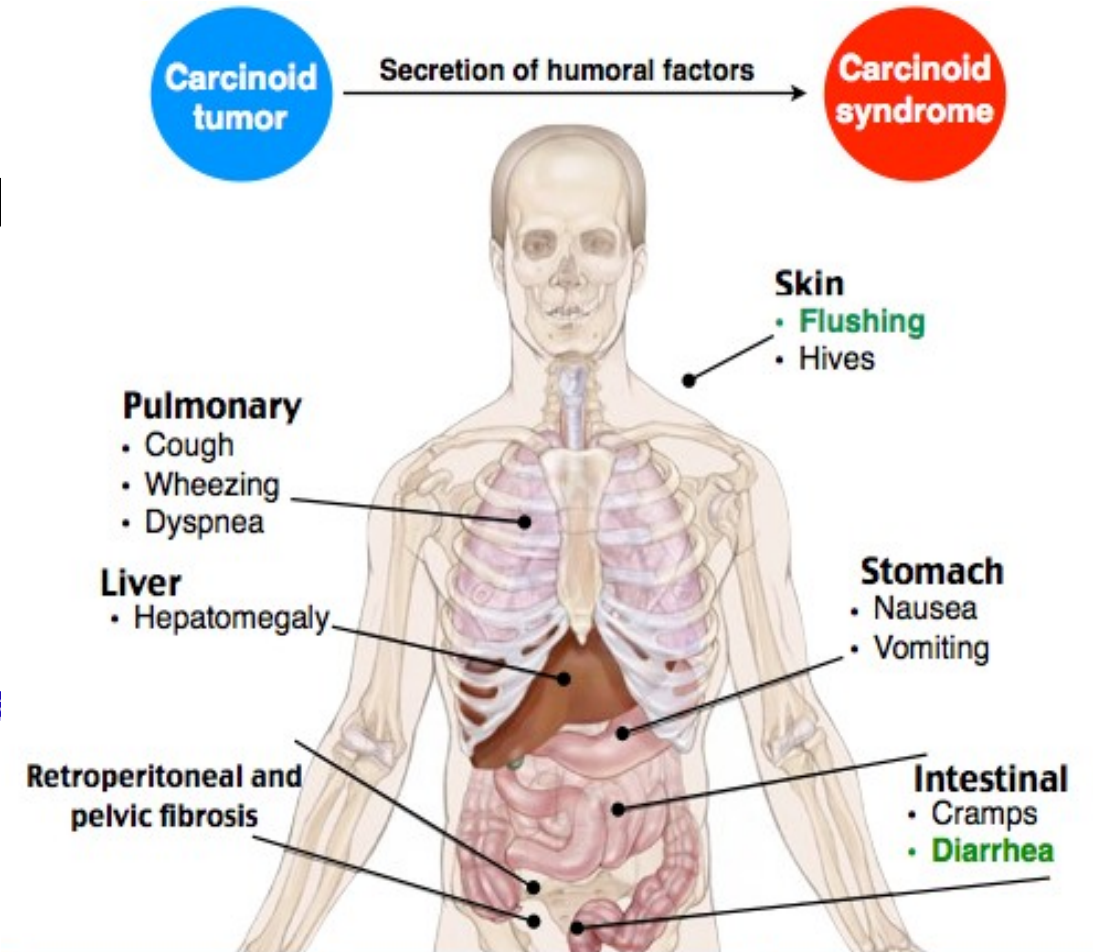
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Bronchial carcinoids



Effects

- 1-Persistent cough and hemopt
- 2-Bronchial obstruction.
- 3-Carcinoid syndrome (10%)
Due to release of serotonin)
causing Intermittent attacks of diarrhea
- 4-Metastasis in hilar nodes (6-
& distant metastases (5%)
(in atypical carcinoids)



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Bronchogenic carcinoma



Incidence:

more common in males than females.

Age:

usually more than 40 years.

Its incidence is high *in industrial countries* and is increased with the volume of industrial development.

Bronchogenic carcinoma



Predisposing factors:

- 1- Heavy tobacco smoking due to the polycyclic aromatic hydrocarbon content of tobacco. The *squamous cell carcinoma* and *small cell carcinoma* showed the strongest association with smoking, while *adenocarcinoma* is the most common tumor in females and non-smokers.
- 2- Industrial hazards: e.g. irradiation, charcoal, arsenics, beryllium, iron, newspaper workers and gold miners.
- 3- Air pollution.
- 4- Silicosis and asbestosis.

Bronchogenic carcinoma



- 5- Pulmonary scarring.
- 6- Genetic predisposition.
- 6- Bronchiectasis (due to squamous metaplasia).

Common genetic mutations in lung cancer involve the oncogenes *MYCL* (small cell carcinomas) and *KRAS* (adenocarcinomas); tumor suppressor genes: *TP53* and *RB1*.

Bronchogenic carcinoma

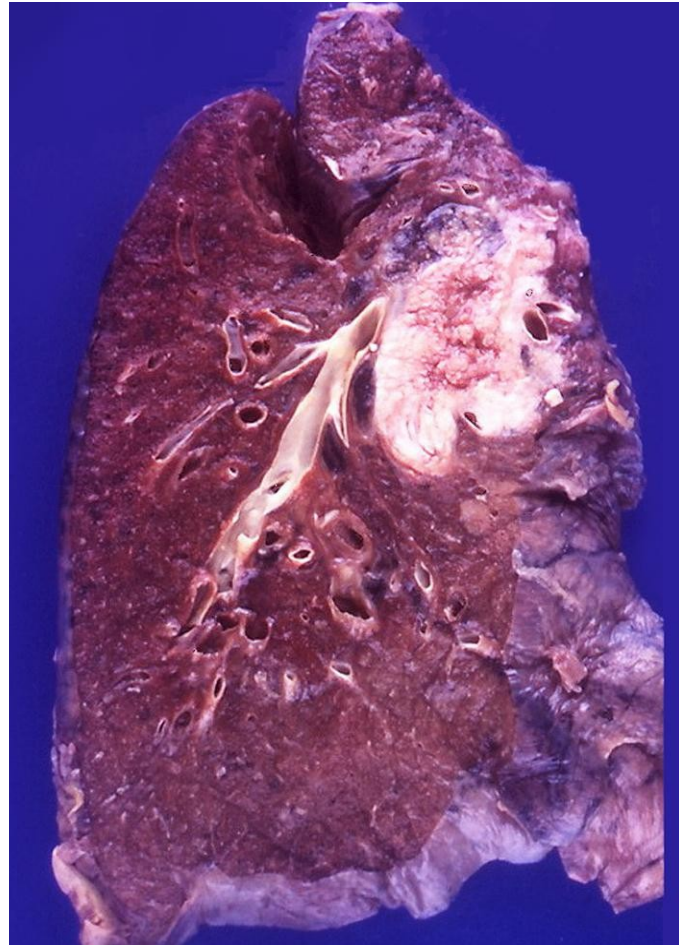


Grossly:

1- Central type (85%):

Arises from the main bronchus near the hilum of the lung
(*Hilar type*) as polypoidal, ulcerative or annular growth.

Squamous cell carcinoma, small cell carcinoma and large cell carcinomas are central tumors.



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Bronchogenic carcinoma



Grossly:

2- Peripheral type (15%):

A small number of primary carcinoma of the lung arises in the periphery of the lung from alveolar septal cells and terminal bronchioles and forms a single or multiple nodular growths. Adenocarcinomas are peripheral tumors.

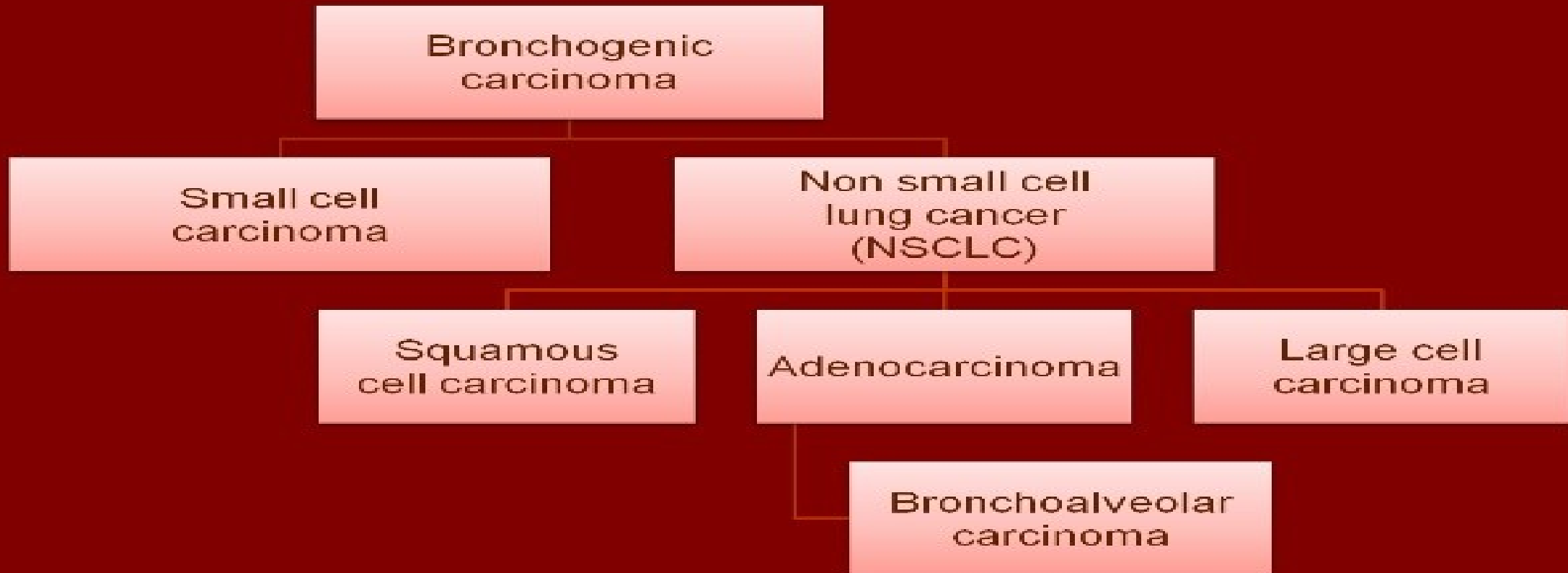


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Microscopic picture of bronchogenic carcinoma



Pathology



Microscopic picture of bronchogenic carcinoma



1- Squamous cell carcinoma:

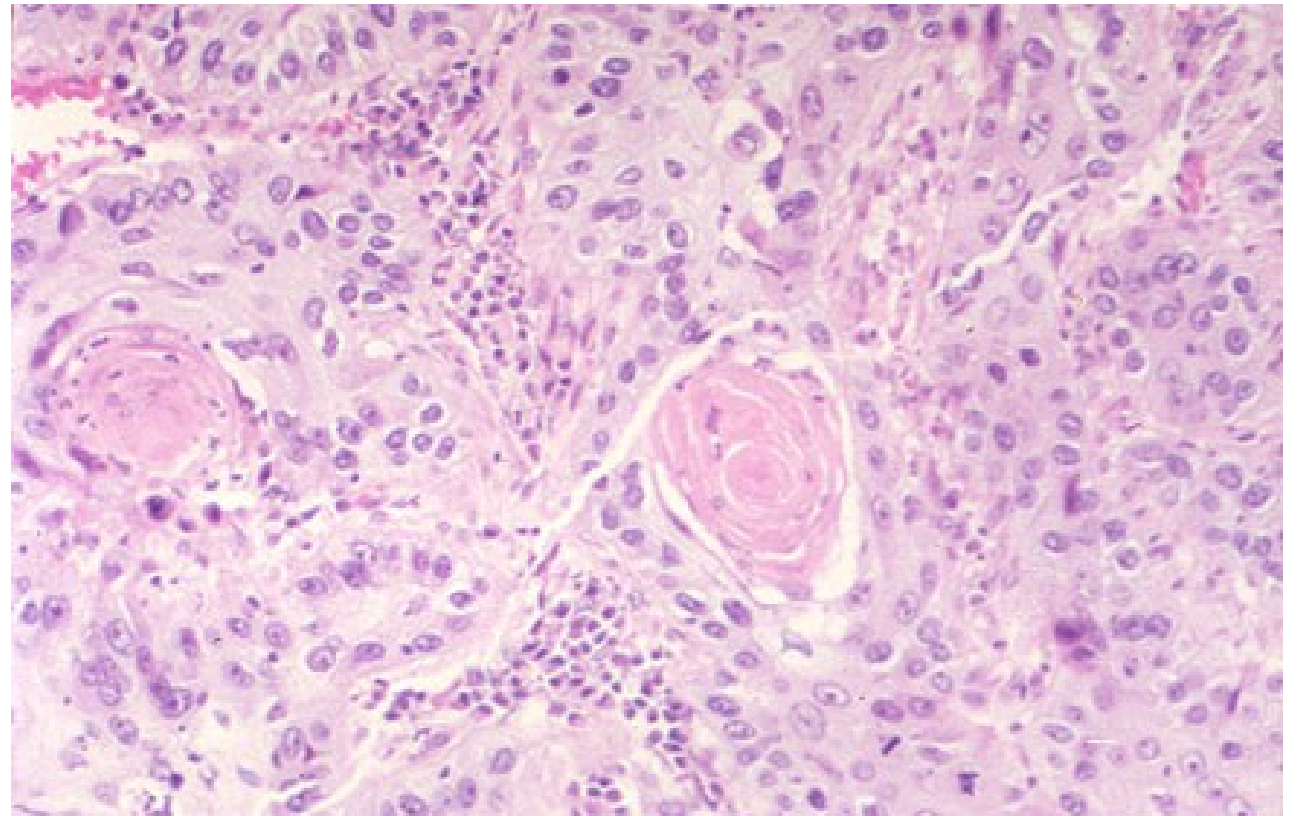
It is the most common type and it is more common in males.

Etiology: it has strong relation to tobacco smoking and usually preceded by long standing

squamous metaplasia of the bronchial epithelium.

Site: it usually arises in the main bronchus

Metaplasia → Dysplasia → Carcinoma *in situ* → Invasive carcinoma



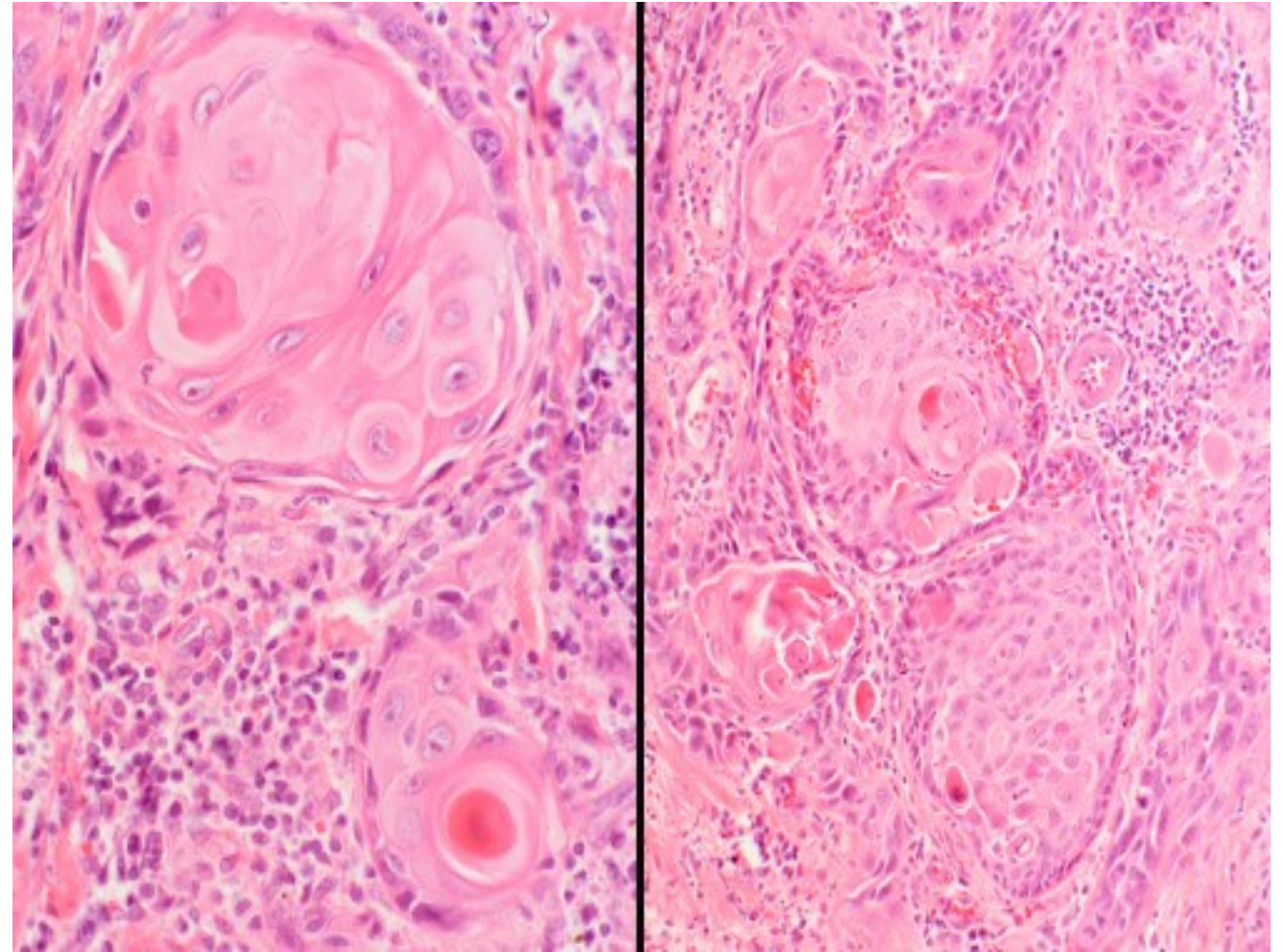
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Microscopic types of bronchogenic carcinoma



Microscopically:

it consists of islands of invading malignant squamous epithelial cells but keratinization is not common (undifferentiated). Tumor cells are positive for CK5/6 (100% of cases).



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Microscopic types of bronchogenic carcinoma



2-

Adenocarcinoma:

the least common type

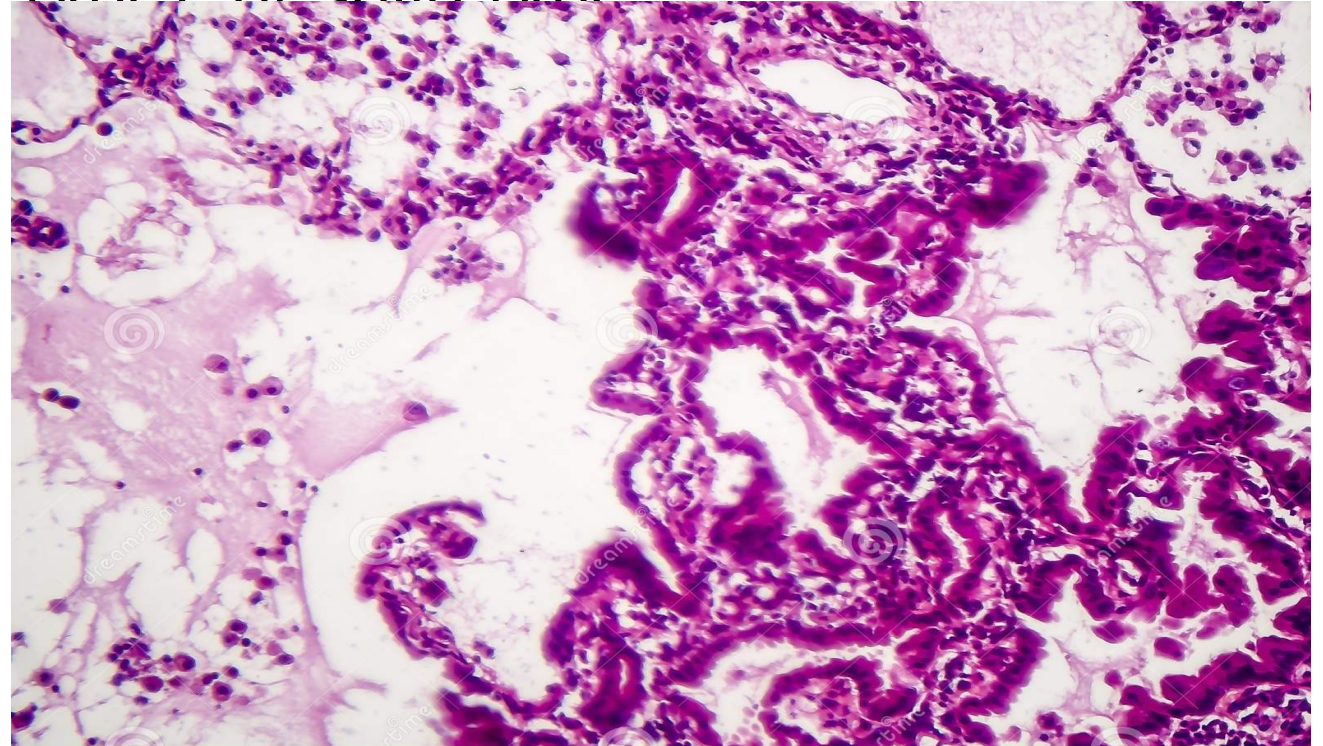
Incidence: more common in females and non smokers.

Etiology: not related to smoking.

Site: occurs mainly in peripheral location of the lung.

Grossly: may be papillary or solid and

Microscopically: consists of malignant glands(acinar) or papillae or may be mucinous (formerly known as bronchioalveolar carcinoma mucinous type) or solid type.



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Microscopic types of bronchogenic carcinoma



3- Small cell carcinoma (oat cell carcinoma):

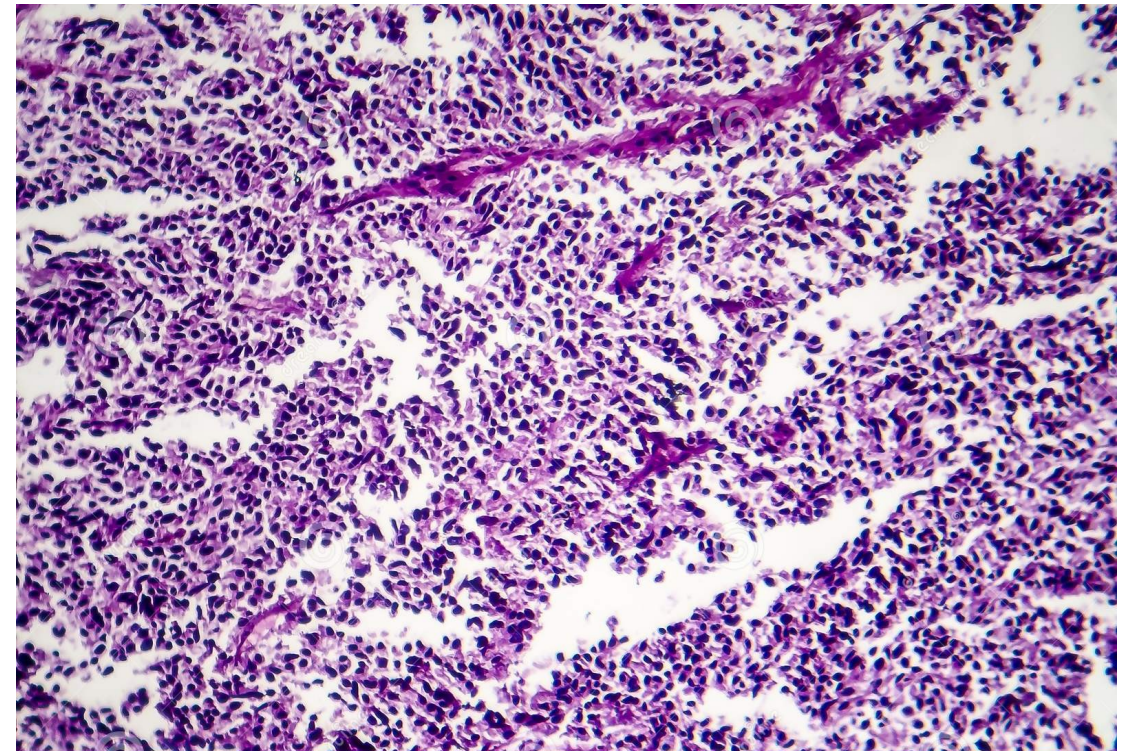
Rapidly growing anaplastic tumor.

Incidence: next in frequency to squamous cell carcinoma.

Etiology: it has a relation to heavy smoking.

Site: in the central portion of the lung near the hilum.

Microscopically: formed of sheets of uniform small rounded or oval cells with dark central nucleus and scanty cytoplasm. The cells contain **dense coarse neurosecretory granules**. This type is usually associated with paraneoplastic syndrome [Especially Cushing's syndrome].



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Microscopic types of bronchogenic carcinoma



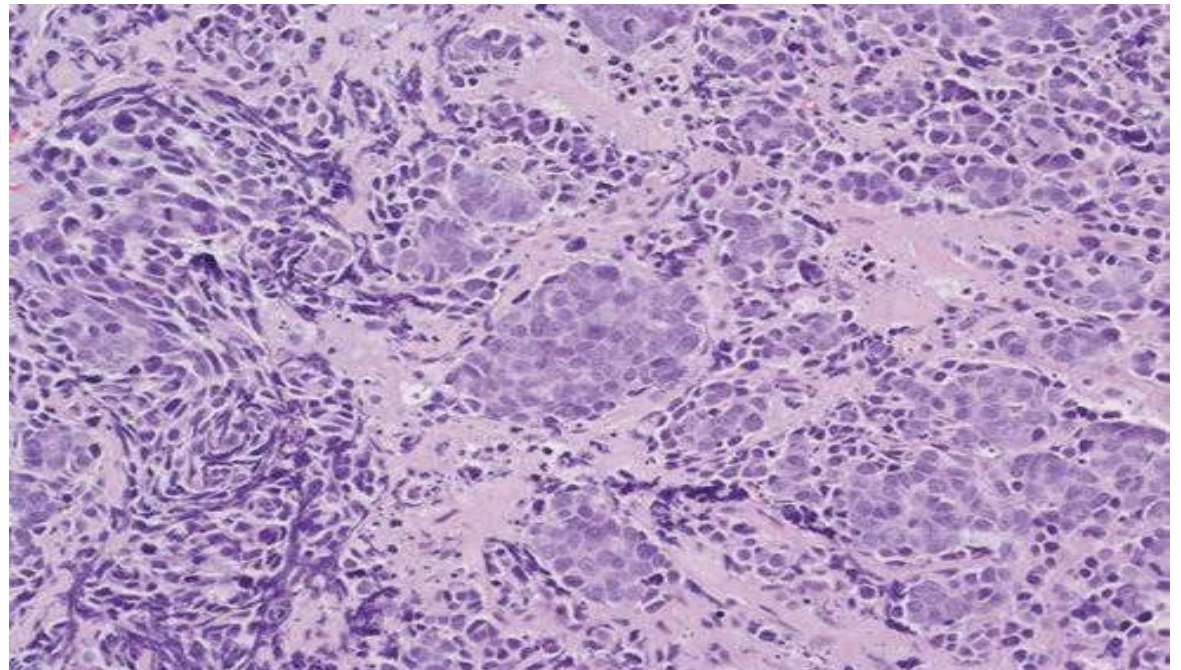
Small cell carcinoma has a strong association with smoking, and affects males more than females.

This neuroendocrine tumor is very aggressive, with rapid growth and early dissemination.

Small cell carcinoma is commonly associated with **paraneoplastic syndromes.**

Tumor cells are positive for neuroendocrine markers such as ***synaptophysin***.

Cell proliferation is almost 100% (Assessed by Ki 67).



Kaplan Medical step 1, lecture notes in Pathology: Chapter 14, Respiratory system , pp. 125-143, 2017.

Microscopic types of bronchogenic carcinoma

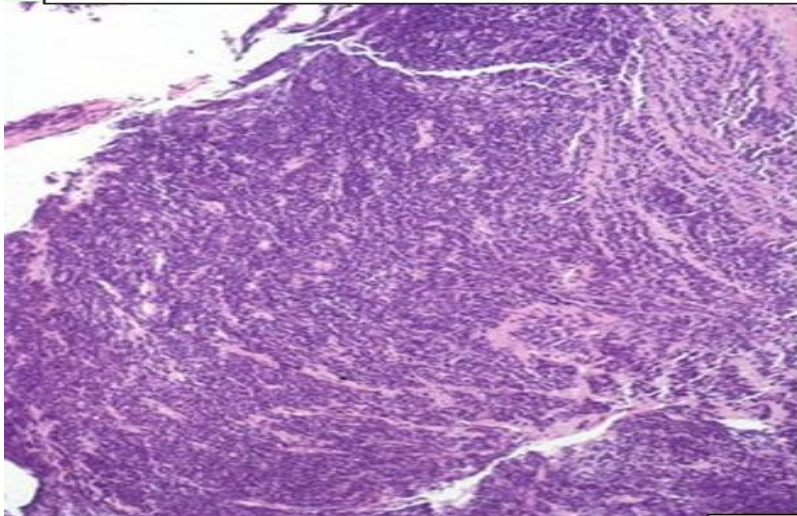


Small Cell Carcinoma

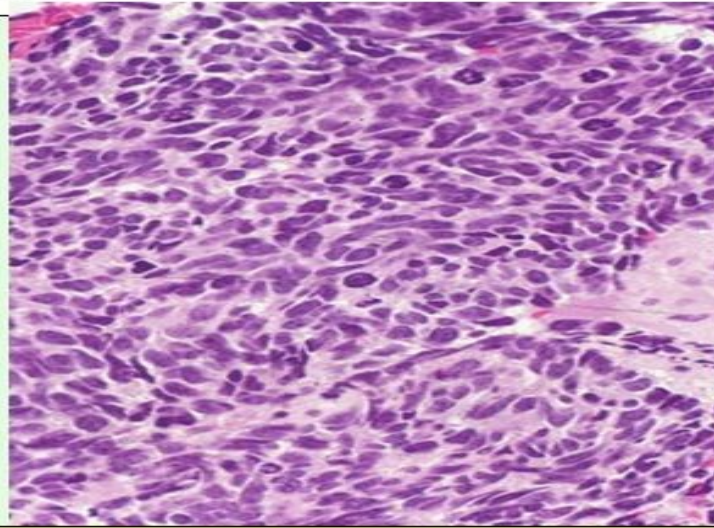
It appears as a pale grey **centrally** located mass with extension into the lung parenchyma.

It involves the **hilar & mediastinal lymph nodes early**.

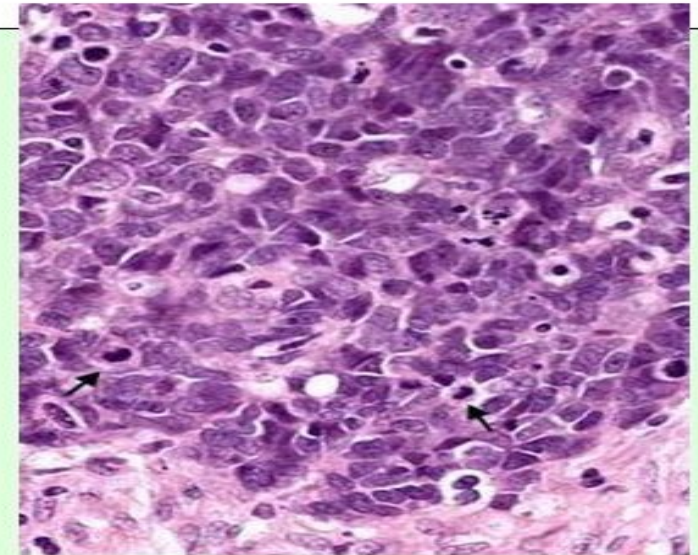
Microscopic: It is composed of tumour cells with a **round, oval or fusiform** shape with **scanty cytoplasm** and a **finely granular chromatin**. **Mitotic figures** are frequently seen.



dark small cells



Round or fusiform cells & little cytoplasm



Finely granular chromatin

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Microscopic types of bronchogenic carcinoma

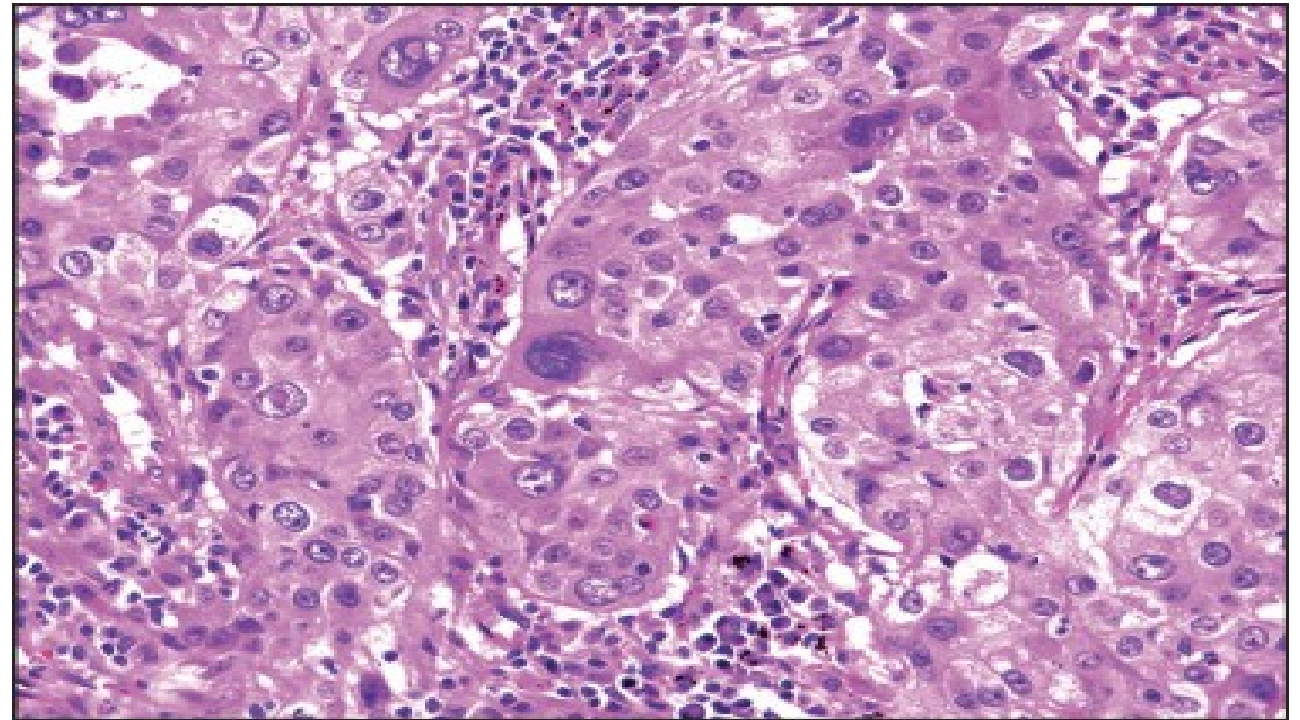


4- Large cell carcinoma: Includes large cell anaplastic carcinomas and giant cell carcinoma.

Site: central in location.

The tumor cells are positive for **CK7 & TTF1**

Microscopically: Shows all shapes and sizes of cells with no distinctive characteristics.



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Bronchogenic carcinoma



Effects of lung carcinoma:

1. Bronchial obstruction.
2. Hemoptysis.
3. Hemorrhagic pleural effusion.
4. Paraneoplastic syndrome (hypercalcaemia, clubbing of fingers, Cushing)

Bronchogenic carcinoma



Spread of lung carcinoma:

- 1- Direct spread to the lung, pleura, and mediastinal structures.
- 2- Lymphatic spread to the hilar, mediastinal and supraclavicular lymph nodes.
- 3- Blood spread through:
 - a- The pulmonary artery to the lungs
 - b- The pulmonary veins to the liver, brain, bones and **ADRENAL GLANDS** in

Bronchioloalveolar Carcinoma



Rare Malignant tumor as a type of pulmonary adenocarcinoma.

Gross :

Solitary ,
diffuse pneumonia -like growth or
multiple(multicentric).

Microscopic: The alveoli & bronchioles are lined by malignant cells. TWO PATTERN

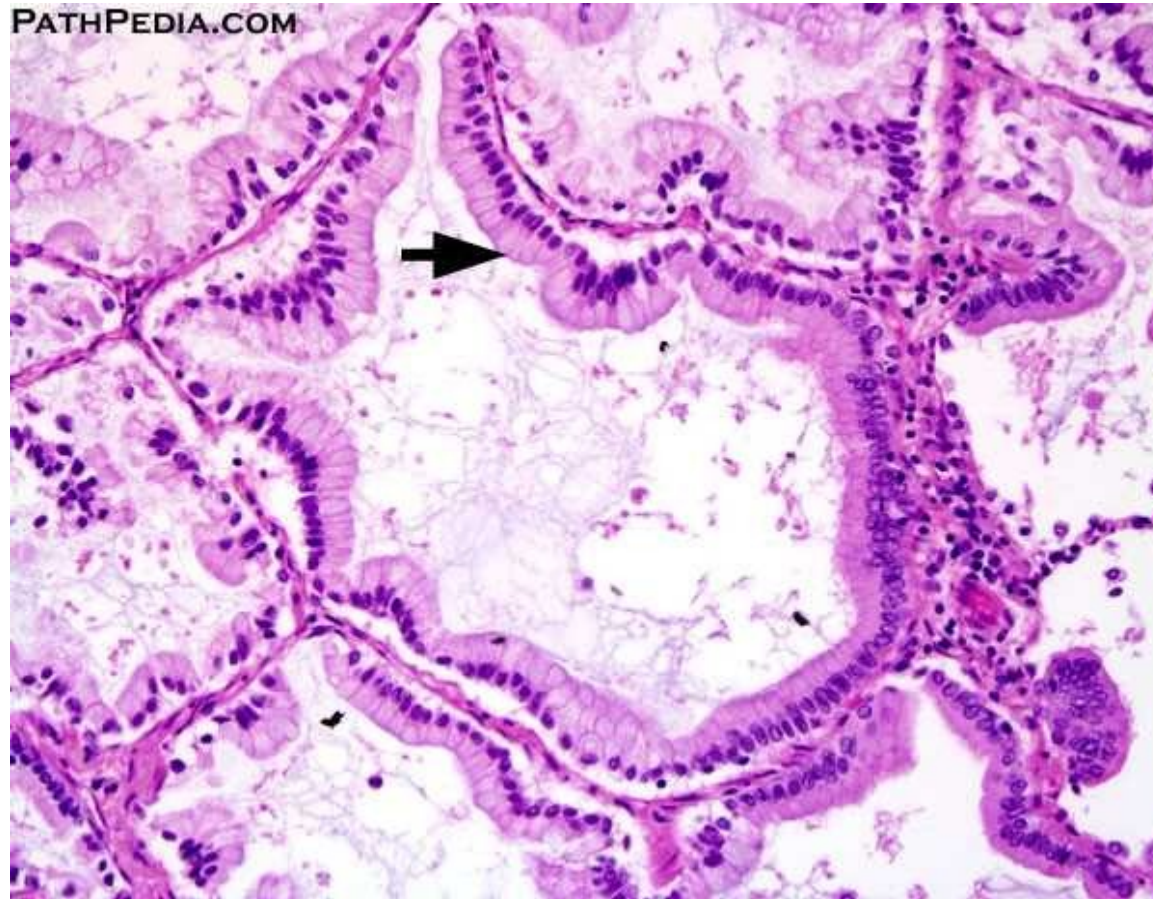
Mucinous : Columnar mucin secreting cells.

Non Mucinous: Cuboidal & eosinophilic. (Better prognosis)

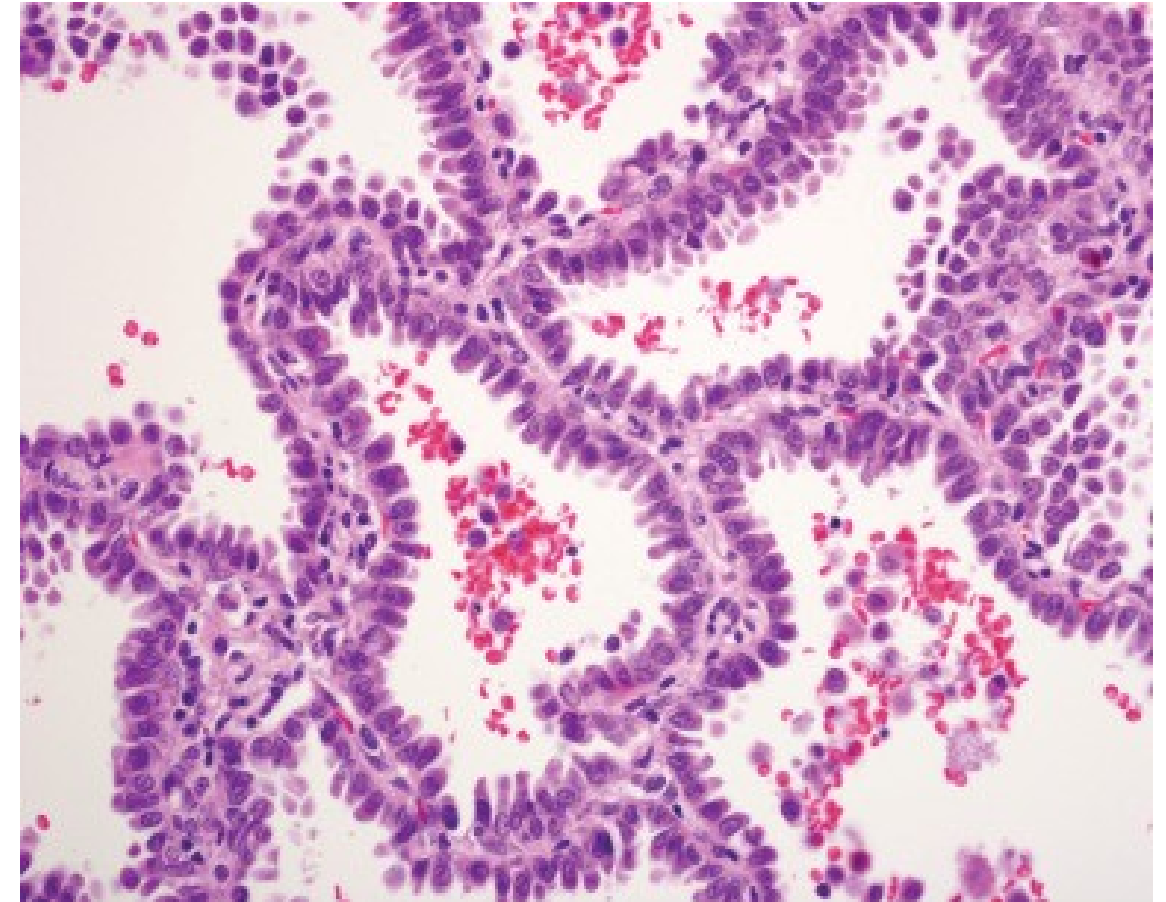
Prognosis:

-BETTER than classic adenocarcinoma

Bronchioloalveolar Carcinoma



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Secondary (metastatic) tumors of the lung



- Both sarcomas & carcinomas reach the lung via **lymphatic & blood streams**.
- The metastasis reach the lung either by the pulmonary artery, the bronchial artery, retrograde lymphatic spread [from the breast] or direct spread from surroundings.
- Carcinomas of breast, thyroid, kidney, prostate and placenta [choriocarcinoma] and sarcomas reach the lung via the blood stream.

Secondary (metastatic) tumors of the lung



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Hemoptysis



Definition:

Coughing of frothy blood, red in color and mixed with sputum and air. The blood should be originating from below the vocal cords to be called hemoptysis.

Causes:

1- Diseases of Bronchi:

Bronchitis

Bronchiectasis

Carcinoid tumor and bronchogenic carcinoma

Pulmonary tuberculosis and actinomycosis.

Chronic venous congestion of the lung

Pulmonary infarction.

lung abscess.

Primary and metastatic tumors of the lung.

2- Lung diseases:

3- General:

Blood diseases as purpura, hemophilia, and leukemia. Scurvy and vitamins deficiency

Lecture Quiz



A male patient aged 55 years suffers from chronic cough since six months, recently he started to show clinical manifestations of Cushing syndrome. Examination revealed nothing in the suprarenal gland, but X ray chest shows central mass. What is the most possible diagnosis?

- a- Squamous cell carcinoma of the lung
- b- Adenocarcinoma of the lung**
- c- Small cell carcinoma of the lung
- d- Metastatic carcinoma of the lung

Lecture Quiz



Match true or false:

1-The common gene mutation in squamous cell carcinoma of the lung involves the oncogene BRCA1

False

2-Bronchiectasis is a premalignant lesion of bronchogenic carcinoma

True

SUGGESTED TEXTBOOKS



- 1- Kaplan Medical step 1, lecture notes in Pathology: Chapter 14, Respiratory system , pp. 125-143, 2017.
- 2- Hursh Mohan Text Book of Pathology, 7th ed. (2015): Chapter 14, Respiratory system, pp. 442-488.
- 3- Hursh Mohan Text Book of Pathology, 7th ed. (2015): Chapter 15, eye, ENT and neck, pp. 495-500
- 4- Robbins basic of Pathology, 10th ed. (2018): Chapter 13, Lung. pp. 495-549

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Thank you!